

Date: Monday, 7/16/2007 2:42:03 PM  
 User: Kim Johnston

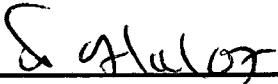
## Process Sheet

Customer	CU-DAR001 Dart Helicopters Services	Drawing Name	HIGH AFT X-TUBE 412
Job Number	33540	Part Number	D412664203
Estimate Number	10559	Drawing Number	D412-664-243 REV D
P.O. Number	N/A	Project Number	N/A
This Issue	7/16/2007	Type	LANDING GEAR
Prsht Rev.	NC	Drawing Revision	D
First Issue	N/A	Material	N/A
Previous Run	33539	Due Date	8/5/2007
Written By	JL 07.17		
Checked & Approved By			
Comment	Est Rev:E 04.02.16 Rerformat; Added D3189-1 K/DS Est Rev:F 06-03-29 Remove Comments on Pick List JLM Est Rev:G 06.12.08 per ECN 886 EC Est Rev:H 07-04-30 As per Rev D JLM		

## Additional Product

Job Number:



Seq. #:	Machine Or Operation:	Description:
1.0	DC	DOCUMENT CONTROL  Comment: DOCUMENT CONTROL Photocopy bluefile and create labels as per PPP D412-664-203 CHG 006  JL 07.30 
2.0	D6009129	Crosstube Material  Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s) Pick: Qty Part number Description Batch 1 D6009-129 Crosstube B26548 Check OD = 3.500"; ID = 2.250"  JL 07/10/09
3.0	MORI SEIKI	MORI SEIKI CNC LATHE LARGE  Comment: MORI SEIKI CNC LATHE LARGE 1-Fill tube with sand & install plugs DT8534 on both ends as per Folio FA166 2-Turn first side as per Folio FA166  JL/J.F. 07/10/12 3-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243.
4.0	QC1	INSPECT ALL DIM TO DIM SHEET  Comment: INSPECT ALL DIM TO DIM SHEET  JL/J.F. 07/10/12

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Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 33540

Part Number: D412664203

Job Number:



Seq. #: Machine Or Operation:

Description :

5.0

MORI SEIKI

MORI SEIKI CNC LATHE LARGE



Comment: MORI SEIKI CNC LATHE LARGE

1-Turn second side as per Folio FA166

2-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243.

3- Remove sand and plugs

J.F. 07/10/12

4-Scribe part # and batch # using vibrating stylus as per Dwg D412-664-243

Inside of

Cuff(Donot engrave on outside of tube)

6.0

QC1

INSPECT ALL DIM TO DIM SHEET



Comment: INSPECT ALL DIM TO DIM SHEET

J.F. 07/10/12

7.0

QC8

SECOND CHECK



Comment: SECOND CHECK

and 07/10/14 (1)

8.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Polish entire outside surface of crosstube

Jb 7-10-15

9.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

Er 07/10/15

10.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

Jb 7-10-22

11.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: Inspect work & Chemical conversion Coat

Er 07/10/23

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 33540

Part Number: D412664203

Job Number:



Seq. #: Machine Or Operation:

Description :

12.0 BENDING BENDING MACHINE



Comment: BENDING MACHINE

Bend tube as per Dwg D412-664-243 using CNC bender program 412-af and Folio FT010

C2 7-10-23

13.0 QC15 DIMENSIONAL CHECK OF X-TUBES



*JA 10-24 ①*

Comment: DIMENSIONAL CHECK OF X-TUBES

14.0 LANDING GEAR 1 LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Drill pilot holes in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551

SR/EL

2-Ream hole to finish size in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

07-10-24

3-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243

JP 7-10-25

15.0 HAND FINISHING1 HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

JP 7-10-25

16.0 QC3 INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

*6 7/10/26*

17.0 QC5 INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

*6 7/11/26*

18.0 OUTSIDE SERV.10 OUTSIDE SERVICES -LG



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 0380r

Issue P/O: 4911e LPI as per ASTM 1417

Level 2 Attach copy of NDT results to work order

*C2 7/10/26 ①*

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## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 33540

Part Number: D412664203

Job Number:



Seq. #: Machine Or Operation:

Description :

19.0 PACKAGING 1 PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage

Ensure copy of NDT results attached to work order.

*CS0710/30 ①*

20.0 QC5 INSPECT WORK TO CURRENT STEP



Comment: Inspect for damage & ensure results are as per Dwg D412-664-203

*CS0710/30*

21.0 SPRAY PAINTING SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside and outside crosstube as per QSI 005 4.2

*BT 07-10-31*

2-Paint outside crosstube with White Imron as per QSI 005 4.2

22.0 QC14 INSPECT SPRAY PAINT



Comment: Inspect Spray Paint

Wrap in plastic bag to protect from scratches

*ML 07 10 01*

23.0 D3595 Rubber Cushion (per sq ft)



Comment: Qty.: 0.0492 sf(s)/Unit Total : 0.0492 sf(s)

Rubber Cushion (per sq ft)

.630" x5.70" x2pcs

Batch: 33835

*ML 07 11 05*

24.0 D2856600 Abrasion Strip



Comment: Qty.: 1.7640 f(s)/Unit Total : 1.7640 f(s)

Pick:

Qty Part number Description Batch

2 D2856-600(Cut to 10.090") Abrasion Strip 25656

*BT 07-10-31*

25.0 D28961 Support



Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

Pick:

Qty Part number Description Batch

1 D2896-1 Support 30200

*ML 07 11 01*

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Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 33540

Part Number: D412664203

Job Number:



Seq. #: Machine Or Operation:

Description :

26.0 D31891 Chafing Shield



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Pick:

Qty Part number Description Batch  
2 D3189-1 Chafing Shield

*30201x1*

*104423*

*25 07-10-31*

27.0 MS2192028 Clamp(per MIL-DTL-8783C)



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Pick:

Qty Part number Description Batch  
4 MS21920-28 Clamp *104423*

*25 07-10-31*

28.0 MS2192030 clamp(per MIL-DTL-8783C)



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

clamp(per MIL-DTL-8783C)

batch: *100154*

*M1 07 11 01*

29.0 LANDING GEAR 1 LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

Assemble as per Dwg D412-664-203

*Time: 7:30 AM*

1-Install supports with magnobond as per QSI 015 Adhere for for 12 Hrs

A/R 6398 Magnobond Batch: *M104677*

Expiry Date: *04/08*

*M1 07 11 01*

2-Install clamps as per Dwg D212-664-141. Torque clamps to 80-100 in lb.

*M1 07 11 05 ①*

30.0 QC5 INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

*5 07 11 06*

31.0 PACKAGING 1 PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Pick Packing Kit

Date: Monday, 7/16/2007 2:42:03 PM

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## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 33540

Part Number: D412664203

Job Number:



Seq. #: Machine Or Operation:

Description:

32.0

AN640A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Bolt

Batch: M10457

AS 07/11/07

33.0

AN641A

Bolt



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)

Bolt

Batch: M100743 AS M101418

34.0

AN960JD616

Washer



Comment: Qty.: 18.0000 Each(s)/Unit Total : 18.0000 Each(s)

Washer

Batch: M105125

AS 07/11/07

35.0

MS2104L6

Nut



Comment: Qty.: 6.0000 Each(s)/Unit Total : 6.0000 Each(s)

Nut

Batch: M104374

AS 07/11/07

36.0

QC4

INSPECT 100% KITS FOR COMPLETENESS



Comment: INSPECT 100% KITS FOR COMPLETENESS

AS 07/11/07

37.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and pack for shipping as per PPP D412-664-203

\*\*\*\*\*Ensure tube is not packaged if curing time is less than 12 hrs, see step 27 for application time & date  
\*\*\*\*\*

Time &amp; date of packaging: 07/11/07 @ 2:00pm

AS 07/11/07

Location: 6

PPP Rev: 6

07/11/07

Date: Monday, 7/16/2007 2:42:03 PM  
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## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: HIGH AFT X-TUBE 412

Job Number: 33540

Part Number: D412664203

Job Number:



Seq. #: Machine Or Operation:

Description :

38.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

10/11/09

Job Completion



u 07/11/08

DART AEROSPACE LTD	Work Order:	33540
Description: Crosstube Assembly (412 High Aft)	Part Number:	D412-664-243
Inspection Dwg: D412-664-243 Rev: D		Page 1 of 1

### FIRST ARTICLE INSPECTION CHECKLIST

First Article  Prototype

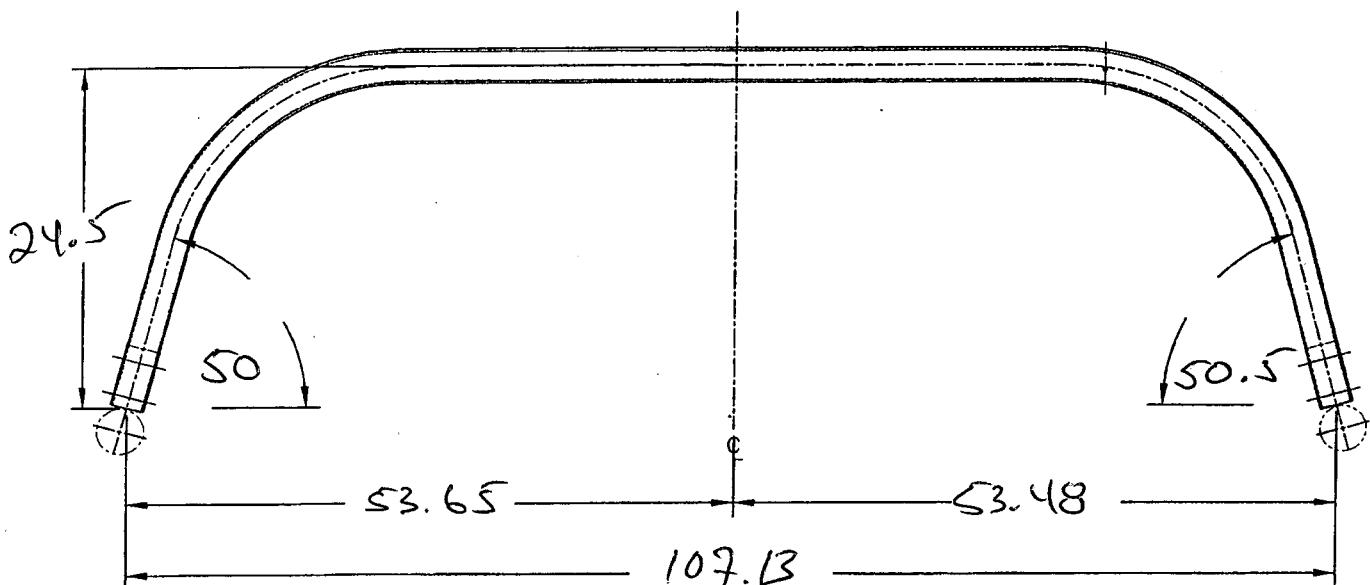
Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.684	+0.005/-0.000	2.688"	✓		
	2.748	+0.005/-0.000	2.752"	✓		
	2.884	+0.005/-0.000	3.887"	✗		
	3.019	+0.005/-0.000	3.021"	✓		
	3.163	+0.005/-0.000	3.164"	✓		
	3.308	+0.005/-0.000	3.311"	✓		
	3.429	+0.005/-0.000	3.432"	✓		
	2.990	+0.005/-0.000	2.994"	✓		
	2.618	+0.005/-0.000	2.621"	✓		
	0.200	+/-0.010	.200	✓		
	R0.063	+/-0.010	.063	✓		
	R0.500	+/-0.010	.500	✓		
	4.971	+/-0.030	4.978"	✓		
SIDE B	2.684	+0.005/-0.000	2.688"	✓		
	2.748	+0.005/-0.000	2.753"	✓		
	2.884	+0.005/-0.000	2.888"	✓		
	3.019	+0.005/-0.000	3.022"	✓		
	3.163	+0.005/-0.000	3.165"	✓		
	3.308	+0.005/-0.000	3.311"	✓		
	3.429	+0.005/-0.000	3.432"	✓		
	2.990	+0.005/-0.000	2.994"	✓		
	2.618	+0.005/-0.000	2.621"	✓		
	0.200	+/-0.010	.200	✓		
	R0.063	+/-0.010	.063	✓		
	R0.500	+/-0.010	.500	✓		
	4.971	+/-0.030	4.975"	✓		
	124.09	+/-0.020	124.09	✓		

Measured by:	JL/J.F.	Audited by:	OML	Prototype Approval:	N/A
Date:	07/10/12	Date:	07/10/14	Date:	N/A

Rev	Date	Change	Revised by	Approved
A	04.06.16	New Issue (P/O D412-664-203)	KJ/JLM	
B	06.03.09	Dwg Rev updated	KJ/JLM	
C	07.05.08	Tolerance updated for dimension 4.971	KJ/JLM	

DART AEROSPACE LTD	Work Order:	33540
Description: Crosstube High Aft (412)	Part Number:	D412-664-203
Inspection Dwg: D412-664-243	Rev: D	Page 1 of 1

Required Dimension	Min	Max
Height	24.24	24.50
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.70



Comments
Tube is even on the height.

QC15 Inspection	<i>Q51042</i>
Date	07-10-24

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	<i>[Signature]</i>
B	07.05.08	Dimensions updated per Dwg rev. D	KJ/JLM <i>[Signature]</i>	<i>[Signature]</i>

**DART**

DESIGN <i>PH</i>	DRAWN BY <i>PH</i>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <i>GP</i>	APPROVED <i>✓</i>	DRAWING NO. D412-664-243	REV. D SHEET 1 OF 3
DATE 07.03.09		TITLE CROSSTUBE ASSEMBLY (412 HI AFT) NTS	
A	01.10.17	NEW ISSUE	
B	05.02.04	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	
C	06.10.27	REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398 MS21920-32 WAS MS21920-30	
D	07.03.09	REMOVE D2732-058, CHANGE TO D3595-063-570	

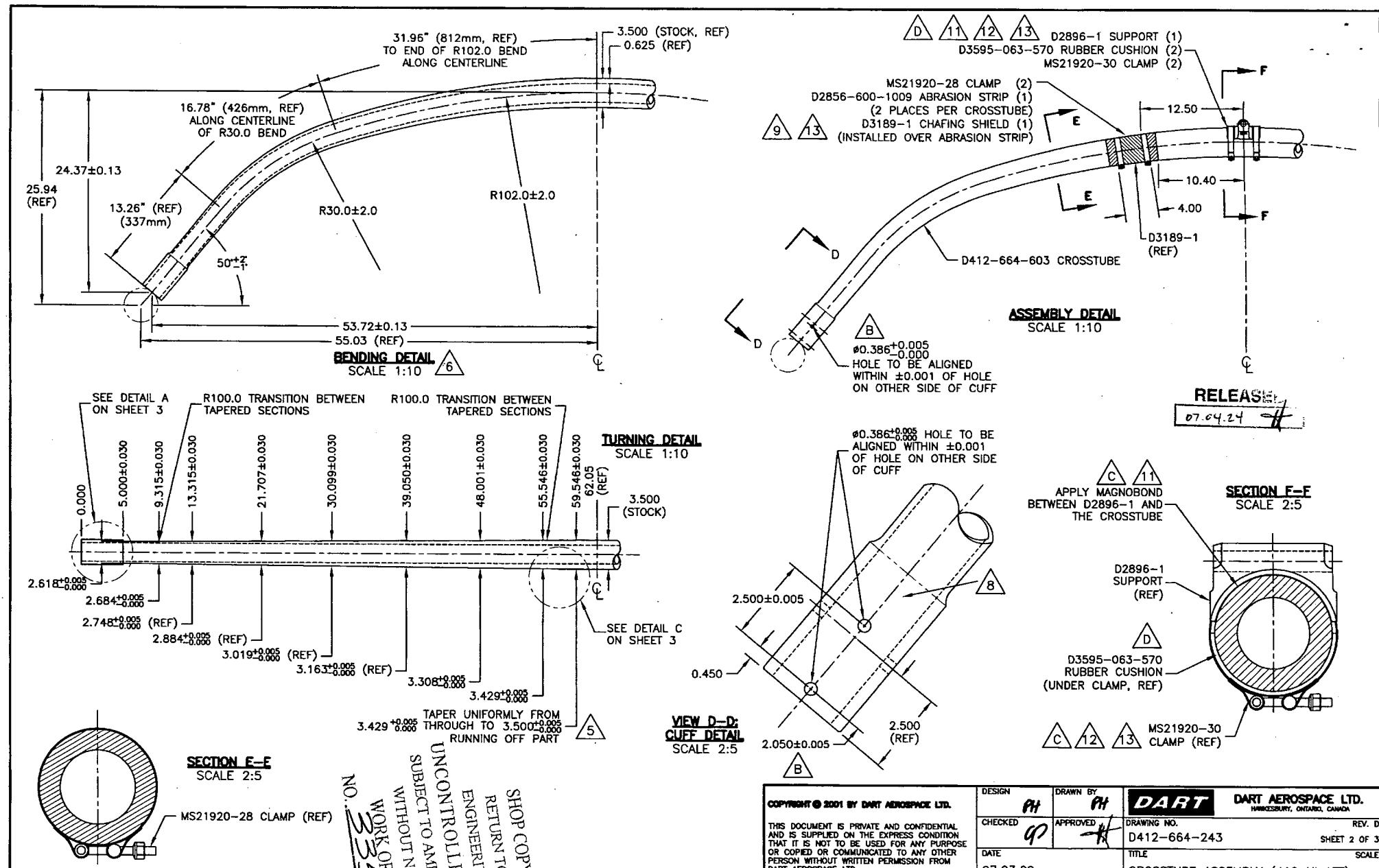
**RELEASED**07.04.24 *✓*

Qty	Part Number	Description
X	D412-664-243	CROSSTUBE ASSEMBLY (412 HIGH AFT)
1	D6009-129	CROSSTUBE
2	D3595-063-570	RUBBER CUSHION
1	D2896-1	SUPPORT
2	D2856-600-1009	ABRASION STRIP
4	MS21920-28	CLAMP
2	MS21920-30	CLAMP (OR MS21920-32)
2	D3189-1	CHAFING SHIELD
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

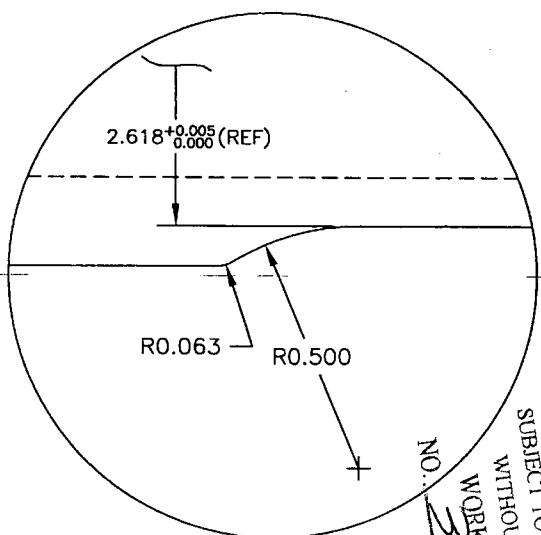
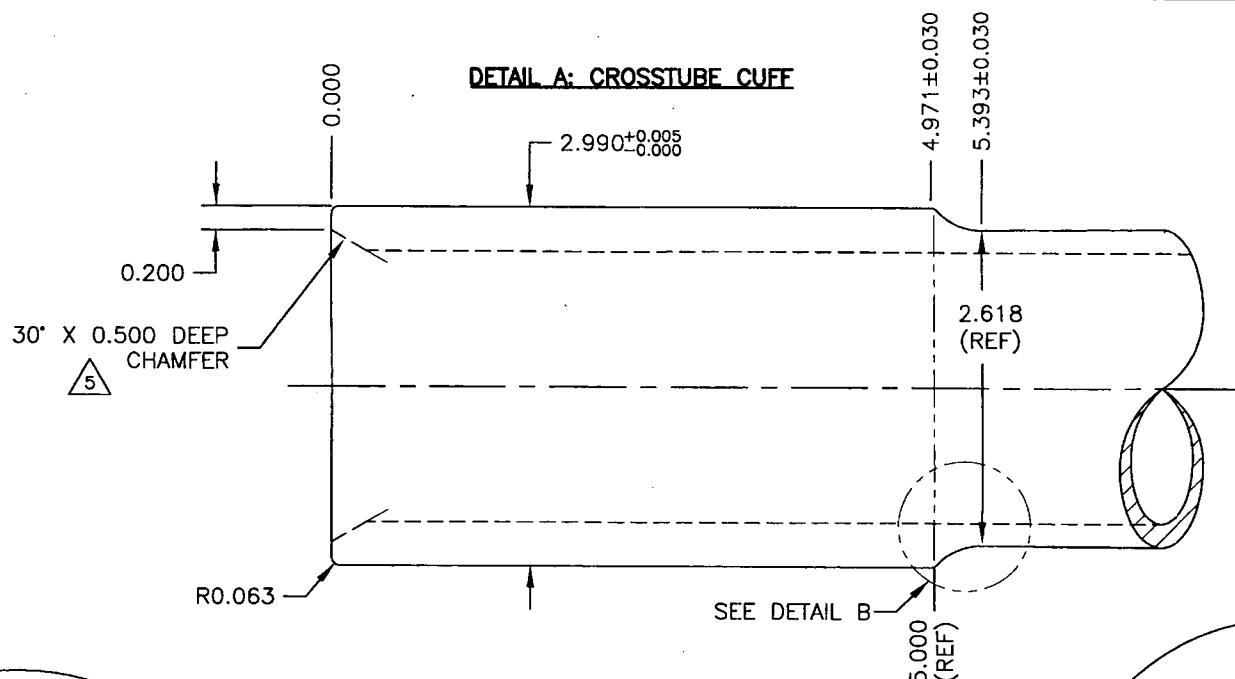
**GENERAL NOTES:**

- 1) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 2) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH =  $124.09 \pm 0.020$
- 3) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005.4.2  
PAINT OUTSIDE PER DART 005 4.2
- 4) PART IS SYMMETRIC ABOUT CENTERLINE.
- 5) RUN-OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 6) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 7) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 8) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 9) INSTALL D2856-600-1009 ABRASION STRIP WITH A 0.13 (REF) GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 10) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO  $0.005"$  MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 11) APPLY A  $0.03"$  TO  $0.06"$  THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 12) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE CROSSTUBE SUPPORT.
- 13) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

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WORK ORDER  
NO. *33540*



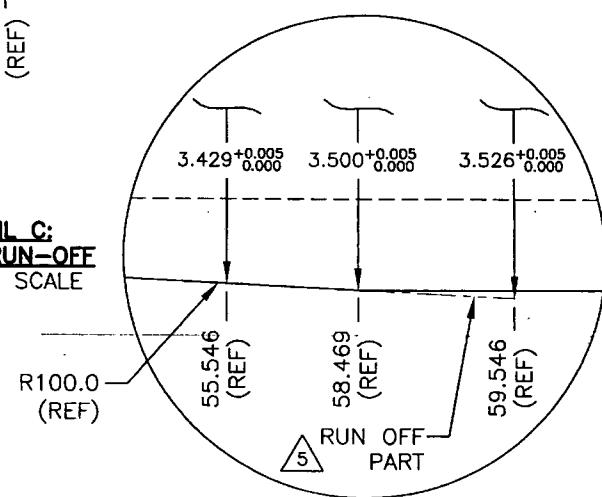
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**DETAIL C:  
TAPER RUN-OFF**  
NOT TO SCALE



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DESIGN	DRAWN BY	DART	DART AEROSPACE LTD. HAWKESBURY, ONTARIO, CANADA
PH	PH		DRAWING NO. D412-664-243 REV. D SHEET 3 OF 3
CHECKED APPROVED			DATE 07.03.09 TITLE CROSSTUBE ASSEMBLY (412 HI AFT) SCALE 1:1





W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes  No  DQA  Date: 07/11/09  
 QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
07/11/06	26,0	Chafing Shield was bent and squeezed all around human error	<u>10</u> 07/11/06	Remove chafing shield and replace with new one.	<u>ml</u> 07/11/06	<u>ml</u> 07/11/06	<u>10</u> 07/11/06	<u>10</u> 07/11/06

NOTE: Date & initial all entries